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Large Deviations and Asymptotic Methods in Finance Springer
In Advanced Equity Derivatives: Volatility andCorrelation, Sébastien Bossu reviews and explains theadvanced concepts used for pricing and hedging equity exoticderivatives. Designed for financial modelers, option tradersand sophisticated investors, the content covers the most importanttheoretical and practical extensions of the Black-Scholesmodel. Each chapter includes numerous illustrations and a shortselection of problems, covering key topics such as impliedvolatility surface models, pricing with implied distributions,local volatility models, volatility derivatives, correlationmeasures, correlation trading, local correlation models andstochastic correlation. The author has a dual professional and academic background,making Advanced Equity Derivatives: Volatility andCorrelation the perfect reference for quantitative researchersand mathematically savvy finance professionals looking to acquirean in-depth understanding of equity exotic derivatives pricing andhedging.

The Time-Dependent FX-SABR Model Springer
Under the SABR stochastic volatility model, pricing and hedging contracts that are sensitive to forward smile risk (e.g., forward starting options, barrier options) require the joint transition density.In this paper, we address this

problem by providing closed-form representations, asymptotically, of the joint transition density. Specifically, we construct an expansion of the joint density through a hierarchy of parabolic equations after applying total volatility-of-volatility scaling and a near-Gaussian coordinate transformation. We then established an existence result to characterize the truncation error and provide explicit joint density formulas for the first three orders. Our approach inherits the same spirit of a small total volatility-of-volatility assumption as in in the original SABR analysis. Our results for the joint transition density serve as a basis for managing forward smile risk. Through numerical experiments, we illustrate the accuracy of our expansion in terms of joint density, marginal density, probability mass and implied volatilities for European call options.

Managing Currency Options in Financial Institutions Springer

This book, first published in 2000, addresses pricing and hedging derivative securities in uncertain and changing market volatility.

Understanding and Managing Model Risk John Wiley & Sons

Barrier options are a class of highly path-dependent exotic options which present particular challenges to practitioners in all areas of the financial industry. They are traded heavily as stand-alone contracts in the Foreign Exchange (FX) options market, their trading volume being second only to that of vanilla options. The FX options industry has correspondingly shown great innovation

in this class of products and in the models that are used to value and risk-manage them. FX structured products commonly include barrier features, and in order to analyse the effects that these features have on the overall structured product, it is essential first to understand how individual barrier options work and behave. FX Barrier Options takes a quantitative approach to barrier options in FX environments. Its primary perspectives are those of quantitative analysts, both in the front office and in control functions. It presents and explains concepts in a highly intuitive manner throughout, to allow quantitatively minded traders, structurers, marketers, salespeople and software engineers to acquire a more rigorous analytical understanding of these products. The book derives, demonstrates and analyses a wide range of models, modelling techniques and numerical algorithms that can be used for constructing valuation models and risk-management methods. Discussions focus on the practical realities of the market and demonstrate the behaviour of models based on real and recent market data across a range of currency pairs. It furthermore offers a clear description of the history and evolution of the different types of barrier options, and elucidates a great deal of industry nomenclature and jargon.

Barrier Option Pricing Under SABR Model Using Monte Carlo Methods

John Wiley & Sons

The book investigates the benefits of Spectral Methods, which are found to be

an appealing numerical technique when the solution in closed form doesn't exist, but unfortunately it cannot be used in every case. A remarkable case in which it is possible to use the Spectral Methods is for pricing the Double Barrier Options as we have seen in Chapter 3. The main achievement of this work is the introduction of two methods, that we have called Geometrical Approximation and Perturbative Method respectively, by which is possible to evaluate the fair option prices in the Heston and SABR market model. Both proposed methods can be generalised to other market models and for pricing other derivatives contracts, although, in order to show the above methodologies, we have chosen to pricing Options of only two kinds: Vanilla Options and knock-out Barrier Options.

Smile Pricing Explained Routledge

The five-volume set LNCS 7971-7975 constitutes the refereed proceedings of the 13th International Conference on Computational Science and Its Applications, ICCSA 2013, held in Ho Chi Minh City, Vietnam in June 2013. The 248 revised papers presented in five tracks and 33 special sessions and workshops were carefully reviewed and selected. The 46 papers included in the five general tracks are organized in the following topical sections: computational methods, algorithms and scientific applications; high-performance computing and networks; geometric modeling, graphics and visualization; advanced and emerging applications; and information systems and

technologies. The 202 papers presented in special sessions and workshops cover a wide range of topics in computational sciences ranging from computational science technologies to specific areas of computational sciences such as computer graphics and virtual reality.

Geometrical Approximation and Perturbative Methods for Pdes in Finance John Wiley & Sons

This book discusses the state-of-the-art and open problems in computational finance. It presents a collection of research outcomes and reviews of the work from the STRIKE project, an FP7 Marie Curie Initial Training Network (ITN) project in which academic partners trained early-stage researchers in close cooperation with a broader range of associated partners, including from the private sector. The aim of the project was to arrive at a deeper understanding of complex (mostly nonlinear) financial models and to develop effective and robust numerical schemes for solving linear and nonlinear problems arising from the mathematical theory of pricing financial derivatives and related financial products. This was accomplished by means of financial modelling, mathematical analysis and numerical simulations, optimal control techniques and validation of models. In recent years the computational complexity of mathematical models employed in financial mathematics has witnessed tremendous growth. Advanced numerical techniques are now essential to the majority of present-day applications in the financial industry. Special attention

is devoted to a uniform methodology for both testing the latest achievements and simultaneously educating young PhD students. Most of the mathematical codes are linked into a novel computational finance toolbox, which is provided in MATLAB and PYTHON with an open access license. The book offers a valuable guide for researchers in computational finance and related areas, e.g. energy markets, with an interest in industrial mathematics.

Novel Methods in Computational Finance

World Scientific Publishing Company

Abstract: The project investigates the prices of barrier options from the constant underlying volatility in the Black-Scholes model to stochastic volatility model in SABR framework. The constant volatility assumption in derivative pricing is not able to capture the dynamics of volatility. In order to resolve the shortcomings of the Black-Scholes model, it becomes necessary to find a model that reproduces the smile effect of the volatility. To model the volatility more accurately, we look into the recently developed SABR model which is widely used by practitioners in the financial industry. Pricing a barrier option whose payoff to be path dependent intrigued us to find a proper numerical method to approximate its price. We discuss the basic sampling methods of Monte Carlo and several popular variance reduction techniques. Then, we apply Monte Carlo methods to simulate the price of the down-and-out put barrier options under the Black-Scholes model and the SABR model as

well as compare the features of these two models.

Computational Science and Its Applications -- ICCSA 2013 World Scientific

From the unique perspective of partial differential equations (PDE), this self-contained book presents a systematic, advanced introduction to the Black-Scholes-Merton's option pricing theory.A unified approach is used to model various types of option pricing as PDE problems, to derive pricing formulas as their solutions, and to design efficient algorithms from the numerical calculation of PDEs. In particular, the qualitative and quantitative analysis of American option pricing is treated based on free boundary problems, and the implied volatility as an inverse problem is solved in the optimal control framework of parabolic equations.

The Best of Wilmott 2 Springer

This book is the Proceedings of the International Workshop on Finance 2011, held in Kyoto in the summer of 2011 with the aim of exchanging new ideas in financial engineering among researchers from various countries from both academia and industry. The workshop was held as a successor to the Daiwa International Workshop (2004–2008), and the KIER-TMU International Workshop (2009–2010). This workshop was organized by the Center for Advanced Research in Finance (CARF), Graduate School of Economics, the University of Tokyo, and Graduate School of Social Sciences, Tokyo Metropolitan University — and co-

organized by Life Risk Research Center, Doshisha University.The workshop serves as a bridge between academic researchers and practitioners.This book contains about fifteen papers, all refereed, representing the presentations at the workshop. The papers address state-of-the-art techniques in financial engineering.

IAENG Transactions on Engineering Sciences McGraw-Hill

Manufacturing and Managing Customer-Driven Derivatives Manufacturing and Managing Customer-Driven Derivatives sheds light on customer-driven derivative products and their manufacturing process, which can prove a complicated topic for even experienced financial practitioners. This authoritative text offers up-to-date knowledge and practices across a broad range of topics that address the entire manufacturing, pricing and risk management process, including practical knowledge and industrial best practices. This resource blends quantitative and business perspectives to provide an in-depth understanding of the derivative risk management skills that are necessary to adopt in the competitive financial industry. Manufacturing and managing customer-driven derivative products have become more complex due to macro factors such as the multi-curve environments triggered by the recent financial crises, stricter regulatory requirements of consistent modelling and managing frameworks, and the need for risk/reward optimisation. Explore the fundamental components of the

derivatives business, including equity derivatives, interest rates derivatives, real estate derivatives, and real life derivatives, etc. Examine the life cycle of manufacturing derivative products and practical pricing models Deep dive into a wide range of customer-driven structured derivative products, their investment or hedging payoff features and associated risk exposures Examine the implications of changing regulatory standards, which can increase costs in the banking sector Discover practical yet sophisticated product analysis, quantitative modeling, infrastructure integration, risk analysis, and hedging analysis Gain insight on how banks should handle complex derivatives products Manufacturing and Managing Customer-Driven Derivatives is an essential guide for quants, structurers, derivatives traders, risk managers, business executives, insurance industry professionals, hedge fund managers, academic lecturers, and financial math students who are interested in looking at the bigger picture of the manufacturing, pricing and risk management process of customer-driven derivative transactions.

Recent Advances in Financial Engineering John Wiley & Sons

The recent financial crisis brought to light many of the misunderstandings and misuses of exotic derivatives. With market participants on both the buy and sell-side having been found guilty of not understanding the products they were dealing with, never before has there been a greater need for clarification and explanation. Exotic Options and Hybrids

is a practical guide to structuring, pricing and hedging complex exotic options and hybrid derivatives that will serve readers through the recent crisis, the road to recovery, the next bull market and beyond. Written by experienced practitioners, it focuses on the three main parts of a derivative's life: the structuring of a product, its pricing and its hedging. Divided into four parts, the book covers a multitude of structures, encompassing many of the most up-to-date and promising products from exotic equity derivatives and structured notes to hybrid derivatives and dynamic strategies. Based on a realistic setting from the heart of the business, inside a derivatives operation, the practical and intuitive discussions of these aspects make these exotic concepts truly accessible. Adoptions of real trades are examined in detail, and all of the numerous examples are carefully selected so as to highlight interesting and significant aspects of the business. The introduction of payoff structures is accompanied by scenario analysis, diagrams and lifelike sample term sheets. Readers learn how to spot where the risks lie to pave the way for sound valuation and hedging of such products. There are also questions and accompanying discussions dispersed in the text, each exploited to illustrate one or more concepts from the context in which they are set. The applications, the strengths and the limitations of various models are highlighted, in relevance to the products and their risks, rather than the model implementations. Models are

de-mystified in separately dedicated sections, but their implications are alluded to throughout the book in an intuitive and non-mathematical manner. By discussing exotic options and hybrids in a practical, non-mathematical and highly intuitive setting, this book will blast through the misunderstanding of exotic derivatives, enabling practitioners to fully understand and correctly structure, price and hedge theses products effectively, and stand strong as the only book in its class to make these “exotic” concepts truly accessible.

Market Risk Analysis, Pricing, Hedging and Trading Financial Instruments Springer

Smile Pricing Explained provides a clear and thorough explanation of the concepts of smile modelling that are at the forefront of modern derivatives pricing. The key models used in practice are covered, together with numerical techniques and calibration.

Manufacturing and Managing Customer-Driven Derivatives Springer

Accessible VBA coding for complex financial modelling How to Implement Market Models Using VBA makes solving complex valuation issues accessible to any financial professional with a taste for mathematics. With a focus on the clarity of code, this practical introductory guide includes chapters on VBA fundamentals and essential mathematical techniques, helping readers master the numerical methods to build an algorithm that can be used in a wide range of pricing problems. Coverage includes general algorithms, vanilla instruments, multi-

asset instruments, yield curve models, interest rate exotics, and more, guiding readers thoroughly through pricing in the capital markets area. The companion website (http://implementmodinvba.com/) features additional VBA code and algorithmic techniques, and the interactive blog provides a forum for discussion of code with programmers and financial engineers, giving readers insight into the different applications and customisations possible for even more advanced problem solving.. Financial engineers implement models from a mathematical representation of an asset's performance by building a program that performs a valuation of securities based on this asset. How to Implement Market Models Using VBA makes this technical process understandable, with well-explained algorithms, VBA code, and accessible theoretical explanations. Decide which numerical method to use in which scenario Identify the necessary building blocks of an algorithm Write clear, functional VBA code for a variety of problems Apply algorithms to different instruments and models Designed for finance professionals, this book brings more accurate modelling within reach for anyone with interest in the market. For clearer code, patient explanation, and practical instruction, How to Implement Market Models Using VBA is an essential introductory guide.

Soft Computing in Data Analytics Barrier Option Pricing Under SABR Model Using Monte Carlo MethodsAbstract: The

project investigates the prices of barrier options from the constant underlying volatility in the Black-Scholes model to stochastic volatility model in SABR framework. The constant volatility assumption in derivative pricing is not able to capture the dynamics of volatility. In order to resolve the shortcomings of the Black-Scholes model, it becomes necessary to find a model that reproduces the smile effect of the volatility. To model the volatility more accurately, we look into the recently developed SABR model which is widely used by practitioners in the financial industry. Pricing a barrier option whose payoff to be path dependent intrigued us to find a proper numerical method to approximate its price. We discuss the basic sampling methods of Monte Carlo and several popular variance reduction techniques. Then, we apply Monte Carlo methods to simulate the price of the down-and-out put barrier options under the Black-Scholes model and the SABR model as well as compare the features of these two models.Pricing Continuously Monitored Barrier Options Under the Sabr ModelThe stochastic alpha beta rho (SABR) model introduced by Hagan et al. (2002) is widely used in both fixed income and the foreign exchange (FX) markets. Continuously monitored barrier option contracts are among the most popular derivative contracts in the FX markets. In this paper, we develop closed-form formulas to approximate various types of barrier option prices (down-and-out/in, up-and-out/in) under

the SABR model. We first derive an approximate formula for the survival density. The barrier option price is the one-dimensional integral of its payoff function and the survival density, which can be easily implemented and quickly evaluated. The approximation error of the survival density is also analyzed. To the best of our knowledge, it is the first time that analytical (approximate) formulas for the survival density and the barrier option prices for the SABR model are derived. Numerical experiments demonstrate the validity and efficiency of these formulas.The Time-Dependent FX-SABR ModelWe present a framework for efficient calibration of the time-dependent SABR model in an FX context. In a similar fashion as in Piterbarg (2005) we derive effective parameters, which yield an accurate and efficient calibration. On top of the calibrated FX-SABR model we add a non-parametric local volatility component, which naturally compensates for possible calibration errors. By means of Monte Carlo pricing experiments we show that the time-dependent FX-SABR model enables an accurate and consistent pricing of barrier options and outperforms the constant-parameter SABR model and the traditional Local Volatility model. We also consider the role of the local volatility component in pricing barrier options.Soft Computing in Data Analytics

Smile Pricing Explained provides a clear and thorough explanation of the concepts of smile modelling that are at the forefront of modern derivatives

pricing. The key models used in practice are covered, together with numerical techniques and calibration.

The Complete Guide to Option Pricing Formulas John Wiley & Sons

Presents inference and simulation of stochastic process in the field of model calibration for financial times series modelled by continuous time processes and numerical option pricing. Introduces the bases of probability theory and goes on to explain how to model financial times series with continuous models, how to calibrate them from discrete data and further covers option pricing with one or more underlying assets based on these models. Analysis and implementation of models goes beyond the standard Black and Scholes framework and includes Markov switching models, Lévy models and other models with jumps (e.g. the telegraph process); Topics other than option pricing include: volatility and covariation estimation, change point analysis, asymptotic expansion and classification of financial time series from a statistical viewpoint. The book features problems with solutions and examples. All the examples and R code are available as an additional R package, therefore all the examples can be reproduced.

Modeling, Stochastic Control, Optimization, and Applications Cambridge University Press

Written by leading market risk academic, Professor Carol Alexander, Pricing, Hedging and Trading Financial Instruments forms part three of the

Market Risk Analysis four volume set. This book is an in-depth, practical and accessible guide to the models that are used for pricing and the strategies that are used for hedging financial instruments, and to the markets in which they trade. It provides a comprehensive, rigorous and accessible introduction to bonds, swaps, futures and forwards and options, including variance swaps, volatility indices and their futures and options, to stochastic volatility models and to modelling the implied and local volatility surfaces. All together, the Market Risk Analysis four volume set illustrates virtually every concept or formula with a practical, numerical example or a longer, empirical case study. Across all four volumes there are approximately 300 numerical and empirical examples, 400 graphs and figures and 30 case studies many of which are contained in interactive Excel spreadsheets available from the the accompanying CD-ROM . Empirical examples and case studies specific to this volume include: Duration-Convexity approximation to bond portfolios, and portfolio immunization; Pricing floaters and vanilla, basis and variance swaps; Coupon stripping and yield curve fitting; Proxy hedging, and hedging international securities and energy futures portfolios; Pricing models for European exotics, including barriers, Asians, look-backs, choosers, capped, contingent, power, quanto, compo, exchange, ‘best-of’ and spread options; Libor model calibration; Dynamic models for implied volatility based on principal

component analysis; Calibration of stochastic volatility models (Matlab code); Simulations from stochastic volatility and jump models; Duration, PV01 and volatility invariant cash flow mappings; Delta-gamma-theta-vega mappings for options portfolios; Volatility beta mapping to volatility indices.

Euro-Par 2015: Parallel Processing Workshops Springer Science & Business Media

The stochastic alpha beta rho (SABR) model introduced by Hagan et al. (2002) is widely used in both fixed income and the foreign exchange (FX) markets. Continuously monitored barrier option contracts are among the most popular derivative contracts in the FX markets. In this paper, we develop closed-form formulas to approximate various types of barrier option prices (down-and-out/in, up-and-out/in) under the SABR model. We first derive an approximate formula for the survival density. The barrier option price is the one-dimensional integral of its payoff function and the survival density, which can be easily implemented and quickly evaluated. The approximation error of the survival density is also analyzed. To the best of our knowledge, it is the first time that analytical (approximate) formulas for the survival density and the barrier option prices for the SABR model are derived. Numerical experiments demonstrate the validity and efficiency of these formulas.

Financial Modelling CRC Press

Two large international conferences on Advances in Engineering Sciences were held in Hong Kong, March 12–14, 2014,

under the International MultiConference of Engineers and Computer Scientists (IMECS 2014), and in London, UK, 2–4 July, 2014, under the World Congress on Engineering 2014 (WCE 2014) respectively. This volume contains 37 revised and extended research articles written by prominent researchers participating in the conferences. Topics covered include engineering mathematics, computer science, electrical engineering, manufacturing engineering, industrial engineering, and industrial applications. The book offers tremendous state-of-the-art advances in engineering sciences and also serves as an excellent reference work for researchers and graduate students working with/on engineering sciences. Contents:Switching Boundaries for Flexible Management of Natural Resource Investment under Uncertainty (T Tarnopolskaya, W Chen and C Bao)Using Exotic Option Prices as Control Variates in Monte Carlo Pricing Under a Local-Stochastic Volatility Model (Geoffrey Lee, Zili Zhu and Yu Tian)Multi-period Dynamic Portfolio Optimization through Least Squares Learning (C Bao, Z Zhu, N Langrené and G Lee)On General Solution of Incompressible and Isotropic Newtonian Fluid Equations (A A Maknickas)On the Inversion of Vandermonde Matrix via Partial Fraction Decomposition (Yiu Kwong Man)Fractal Fourier Coefficients with Application to Identification Protocols (Nadia M G Al-Saidi, Arkan J Mohammed, Elisha A Ogada and Adil M Ahmed)Scheduling Algorithm with Inserted Idle Time for

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students in electrical & electronic engineering, computer engineering, industrial engineering and mathematics. Key Features:This volume contains revised and extended research articles written by prominent researchers participating in the conferencesThe book offers the state of art of tremendous advances in engineering sciencesThe book can also serve as an excellent reference work for researchers and graduate students working with/on engineering sciencesKeywords:Engineering Mathematics;Computer Science;Electrical Engineering;Manufacturing Engineering;Industrial Engineering;Industrial Applications

Option Pricing and Estimation of Financial Models with R Springer Stress-test financial models and price credit instruments with confidence and efficiency using the perturbation approach taught in this expert volume Perturbation Methods in Credit Derivatives: Strategies for Efficient Risk Management offers an incisive examination of a new approach to pricing credit-contingent financial instruments. Author and experienced financial engineer Dr. Colin Turfus has created an approach that allows model validators to perform rapid benchmarking of risk and pricing models while making the most efficient use possible of computing resources. The book provides innumerable benefits to a wide range of quantitative financial experts attempting to comply with

increasingly burdensome regulatory stress-testing requirements, including: Replacing time-consuming Monte Carlo simulations with faster, simpler pricing algorithms for front-office quants Allowing CVA quants to quantify the impact of counterparty risk, including wrong-way correlation risk, more efficiently Developing more efficient algorithms for generating stress scenarios for market risk quants

Obtaining more intuitive analytic pricing formulae which offer a clearer intuition of the important relationships among market parameters, modelling assumptions and trade/portfolio characteristics for traders The methods comprehensively taught in Perturbation Methods in Credit Derivatives also apply to CVA/DVA calculations and contingent credit default swap pricing.